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DRAWINGS ATTACHED

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(54) INSTRUMENT FOR THE PARENTERAL PENETRATION OF A NEEDLE

(71) I, PIERRE BEN MOURA, a French citizen, of 5 Côte Saint-Martin, NAY, Basses-Pyrénées, France, do hereby declare the invention for which I pray that a patent may be granted to me, and the method by which it is to be performed to be particularly described in and by the following statement:—

This invention is concerned with instruments which are intended to permit parenteral penetration of a needle and more particularly although not exclusively to instruments for taking blood samples from large animals and especially from cows.

Up to the present time, simple hypodermic needles of conventional type were employed for this purpose in the majority of applications and in some cases were mounted on syringes which accordingly served as handles. The vein was punctured and blood was drawn by means of the syringe or alternatively allowed to flow directly from the needle into a test tube. A more recent practice has consisted in the use of tubes formed of plastics material in which it is possible to mount either a plug fitted with a hollow needle for carrying out the blood sampling operation or a stopper for transporting samples which have thus been collected.

All these instruments are of somewhat rudimentary construction and are subject to a number of drawbacks; in fact, the veterinary surgeon must possess a certain degree of manual skill in order to perform the operation easily, accurately and rapidly to prevent the animal from feeling any pain and consequently from exhibiting defensive movements which frequently slow down or otherwise interfere with the operation. Blood samples are usually taken from a vein in the neck of the animal so that the hollow needle must first pass through the hide, that is to say through a thickness of approximately $\frac{1}{2}$ cm, and then penetrate into the vein to exactly the right depth to ensure that the tip of the needle in fact remains within the interior of the vein and does not pierce the opposite wall of the vein.

[*Price 25p*]

The aim of this invention is to provide an apparatus for carrying out operations of this type accurately and with considerably greater ease without requiring any particular skill on the part of the practitioner

To this end, the instrument in accordance with the invention comprises a hollow generally cylindrical body, a tubular container holder slidable in the body, means releasably mounting a container and a hollow needle in the container holder, a propulsion spring acting between the body and a shoulder at an end of the container holder adjacent which end the needle is located, the spring urging the container holder and thereby the container and the needle to cause parenteral penetration of the needle in use of the instrument, and a releasable latch for holding the container holder against the action of the spring in a retracted position relative to the body.

It will readily be appreciated that a blood sample can very easily be taken from an animal by means of an instrument of this type. Once the container which may be, for example, of a tube of plastics material is mounted within the interior of the instrument, the user has plenty of time to apply the instrument against the region in which the needle is to be inserted. It is then only necessary to release the latch referred-to above in order to cause the needle to be propelled instantaneously and automatically under the requisite force and to a suitable depth through the hide or skin and into the vein from which a blood sample is to be taken. The blood then flows into the tube under the action of gravity and of the blood pressure of the animal.

An instrument embodying the invention may also be used for taking samples of liquid which are not under pressure and also for carrying out injections which can be applied not only to animals but also to human beings if so desired.

To this end, the container may comprise a tube in which is mounted a piston, the said piston being rigidly fixed to one extremity of

a rod whilst the other extremity of the said rod is accessible from the exterior of the instrument body even when the piston has reached its position of maximum penetration with the tube. Thus, once the needle has been introduced into the flesh, it is possible according to requirements either to cause the piston to withdraw when a sample has to be taken or on the contrary to cause said piston to advance if an injection is to be performed.

Embodiments of the invention will now be described by way of example with reference to the accompanying drawings

Figure 1 is a front elevational view of a first embodiment of an instrument in accordance with the invention;

Figure 2 is a side elevational view of the embodiment shown in Fig. 1;

Fig. 3 is a sectional view taken along line III—III of Fig. 1;

Fig. 4 shows an alternative form of the container of Fig. 3;

Fig. 5 shows another form of construction of a container which is intended for use in the instrument of Figs. 1 to 3;

Fig. 6 shows yet another form of construction of the container.

The instrument for parenteral penetration of a needle, as illustrated in Figs. 1 to 3 comprises essentially a body 1, a sliding tubular container holder 2, a container 3, a hollow needle 4, a mouthpiece 5, a propulsion spring 6 and a latch 7.

The instrument body 1 may be formed of a plastics material or of metal and, in this example of construction, is of elongated shape and has a configuration such as to afford a convenient grip for the user. The body which is illustrated is accordingly provided with hollowed-out portions such as those which are designated by the reference numeral 11 and in which the operator's fingers may be placed in order to ensure a good grip.

The sliding support 2 is constituted by a tubular member which is capable of sliding axially within a bore 14 of the body 1 and in the inner extremity of which is screwed an end-cap 15 having a diameter which is slightly larger than the external diameter of the sliding support 2 so as to serve as guide for said support within an enlarged portion 17 of the bore of the instrument body 1. The central portion of the end-cap 15 is provided on its external face with a boss 20 on which is fixed the socket connector 21 of the hollow needle 4. An axial bore 23 is pierced right through the end-cap 15 and provides a communication between the hollow needle 4 and the interior of the container 3 which is mounted in the sliding container holder 2. The mouthpiece 5 is screwed into the extremity of the body 1 in which is located the hollow needle 4. The mouthpiece is pierced by a central bore 24 and provided with a rounded rib 25 which is located in a diametral plane and has a generally concave crescent shape; said rib is intended to be closely applied against the skin of the animal in the zone of a vein from which a blood sample is to be taken

The propulsion spring 6 is a compressed helical compression spring, one extremity of which is applied against the peripheral portion of the inner face of the end-cap 15 of the container holder 2 whilst the other extremity of the spring is applied against the annular shoulder 26 which is formed as a result of the difference in diameter between the two portions 14 and 17 of the bore of the instrument body 1.

The container holder 2 can be maintained in the retracted position which is illustrated and in which the extremity of the hollow needle has been withdrawn into the central bore 24 of the mouthpiece 5; this is achieved by means of the latch 7 which is pivotally mounted on a pin 28 within a longitudinal slot 27 of the body, the extremity of said latch being engaged in an annular groove or notch 31 which is formed in the sliding container holder 2. The latch 7 can be disengaged from the notch 31 by means of external releasing means constituted in this example by a push-button 33 which is integral with one extremity of an extension arm 34 of the latch 7 and which is urged outwards by a small helical compression spring 35, the spring 35 beng applied against the bottom of the slot 27 of the body 1.

The container 3 which is intended to collect the blood sample is constituted in this form of construction by a tube of plastics material, for example. One extremity of said tube is closed whilst the other extremity is open and is applied against the inner face of the end-cap 15. The tube 3 can be freely inserted in the sliding container holder 2 at the open outer extremity of container holder 2 and is held in position within the holder by means of two small catches 41 which are pivotally mounted on pins 42 within two slots 43 respectively which are formed in the outer extremity of the sliding container holder 2, said extremity being enlarged for this purpose. The extremities of the catches 41 are urged against one end of an annular enlargement or boss 45 formed on a corresponding portion of the tube 3 and are maintained resiliently in this position by means of springs 46 which are fitted within corresponding holes of the container holder. The boss 45 of the tube is applied resiliently against the extremities of the two catches 41 by means of another helical compression spring 48, the two extremities of which are applied respectively against the other end of the boss 45 and against an annular shoulder 49 which is formed in the corresponding portion of the bore of the container holder 2. The two catches 41 are provided respectively with extensions in the form of two push-buttons 51 which can be gripped together between the operator's

thumb and forefinger in order to draw the push-buttons together and thus displace the two catches 41 outwards so as to free the boss 45 and consequently the container 3, thereby permitting the ejection of the container under the action of the spring 48

The level of the liquid which accumulates within the tube can be observed through a longitudinal slot 54 in the instrument body 1 and a corresponding longitudinal slot 55 in the container holder 2. The container holder 2 is maintained in a constant angular position with respect to the body 1 by means of a stud 56 which is fixed radially in the body 1 and one extremity of which is engaged within the longitudinal slot 55 of the container holder 2.

The pierced end-cap 15 is additionally provided with a duct 57 for connecting the container 3 to the atmosphere in order that the air which is present within said container may be discharged progressively as it is replaced by the liquid which is being collected.

The operation of the instrument is as follows:—

Assuming that the apparatus is equipped with a hollow needle and a tubular container as illustrated in the drawings for the purpose of taking a blood sample, the instrument body 1 is gripped firmly in one hand and placed against the animal, the rib 25 of the mouthpiece 5 being carefully applied so as to be placed across the vein from which the blood specimen is to be taken. When the instrument has thus been accurately centred, it is only necessary to press the push-button 33 in order that the needle should penetrate instantaneously under the action of the propulsion spring 6 through the skin and the wall of the vein considered. The operator maintains the instrument without moving while the blood flows into the container under the combined effects of gravity and of the blood pressure. He observes the level of liquid through the slots 54 and 55 and then quickly withdraws the instrument as soon as a sufficient quantity of blood has been collected. The operator then removes the filled container 3 by pressing the two catch-buttons 51 simultaneously and closes the container 3 by means of a conventional plug (not shown in the drawings) which he places over the open end of the container. The operator replaces this container with a fresh, empty container, resets the instrument by exerting a tractive force on the outer extremity of the container holder 2 until the latch 7 again engages in the annular groove 31 of the container holder and the instrument is then ready for further operation.

When it proves necessary to collect a liquid which is not under pressure or which has too high a viscosity to flow freely through the needle into the container, especially when a relatively fine needle is employed as is the case, for example, when taking a biopsy sample from an organ of the human body or alternatively when it is necessary to carry out an injection instead of a sampling operation, the simple container 3 which is shown in Fig. 3 is in that case replaced by a container 3*A* (as shown in Fig. 4) which comprises a tube fitted with a piston 61. The piston 61 is slidably mounted within said container and rigidly fixed to a rod 62, the outer extremity of which carries an operating knob 63 which still remains accessible from the exterior of the container holder 2 even when the piston 61 is in its position of maximum penetration as shown in Fig. 4.

In order to make use of a container of this type, the procedure is the same as that which was described earlier in connection with the insertion of the needle. However, depending on whether it is necessary to carry out a sampling operation or an injection operation, insertion of the needle is carried out respectively when the piston has reached its position of maximum penetration as shown in Fig. 4 or when the piston is withdrawn and the tube is filled with liquid to be injected.

Once the needle has been inserted into the patient there is then exerted either a pull on the knob 63 in order to carry out the sampling operation or on the contrary a thrust in order to carry out an injection.

This syringe container 3*A* is positioned and removed in the same manner as the simple container 3 of Fig. 3.

In order to satisfy requirements for sterile conditions, the container 3 of Fig. 3 can be replaced by the container 3*B* of Fig. 5 or the container 3*A* of Fig. 4 can be replaced by the container 3*C* of Fig. 6; the hollow needle 4 is incorporated directly with said containers and is in that case used only once.

For the purpose of mounting the container 3*B* or the container 3*C* within the instrument, use is made of an end-cap 15*A* (as shown in Fig. 5) which is slightly modified with respect to the end-cap 15 of Fig. 3, which is also screwed into the inner extremity of the container holder 2, but which has a central opening 65 of relatively large diameter in order to accommodate the narrowed upper extremity of the container 3*C* as shown in Fig. 5.

The utilisation of the instrument in conjunction with the container 3*B* of Fig. 5 or with the container 3*C* of Fig. 6 is carried out generally in the same manner as in the case of the container 3 of Fig. 3 or 3*A* of Fig. 4 respectively.

When use is made of a syringe container such as the container 3A of Fig. 4 or the container 3*C* of Fig. 6, the movement of penetration of the piston 61 can be followed visually through the slots 54 and 55 of the instrument.

WHAT I CLAIM IS:—

1. An instrument for parenteral penetration of a needle, comprising a hollow generally cylindrical body, a tubular container holder slidable in the body, means releasably mount-

ing a container and a hollow needle in the container holder, a propulsion spring acting between the body and a shoulder at an end of the container holder adjacent which end the needle is located, the spring urging the container holder and thereby the container and the needle to cause parenteral penetration of the needle in use of the instrument, and a releasable latch for holding the container holder against the action of the spring in a retracted position relative to the body.

2. An instrument according to claim 1, wherein the hollow needle is directly mounted on the container holder.

3. An instrument according to claim 1 or 2, wherein the container is in the form of a cylindrical tube which is closed at one end whilst the other end of the said tube is open and is applied against a pierced end-cap which closes one end of the interior of the container holder.

4. An instrument according to claim 1, wherein the hollow needle is mounted on the container and thereby mounted in the container holder.

5. An instrument according to any of the preceding claims, wherein the container is a tube which is closed at one end.

6. An instrument according to any of claims 1 to 4, wherein the container comprises a tube in which is mounted a piston, the said piston being rigidly fixed to one extremity of a rod whilst the other extremity of the said rod is accessible from the exterior of the instrument body even when the piston has reached its position of maximum penetration within the tube.

7. An instrument according to any of the preceding claims, wherein a catch secures the container in the container holder and means are provided which can be operated from the exterior of the body to disengage the said catch from the said container.

8. An instrument according to claim 7 wherein the container has an external annular retaining boss which cooperates with the said catch.

9. An instrument according to any of the preceding claims, wherein the body further comprises a mouthpiece having a bore therethrough and the tip of the hollow needle is withdrawn into the interior of the said mouthpiece when the container holder is retained by the latch, the bore permitting outward displacement of the needle when the latch is released.

10. An instrument according to claim 9, wherein the mouthpiece is provided with a rounded external rib located in a plane diametral relative to a longitudinal axis of the instrument and having a generally concave crescent shape, a passageway for the needle being formed at the centre of said rib.

11. An instrument for parenteral penetration of a needle, substantially as hereinbefore described with reference to Figures 1 to 3 of the accompanying drawings.

12. An instrument according to claim 11, modified substantially as hereinbefore described with reference to any of Figures 4 to 6 of the accompanying drawings.

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Sheet 1

Fig:1

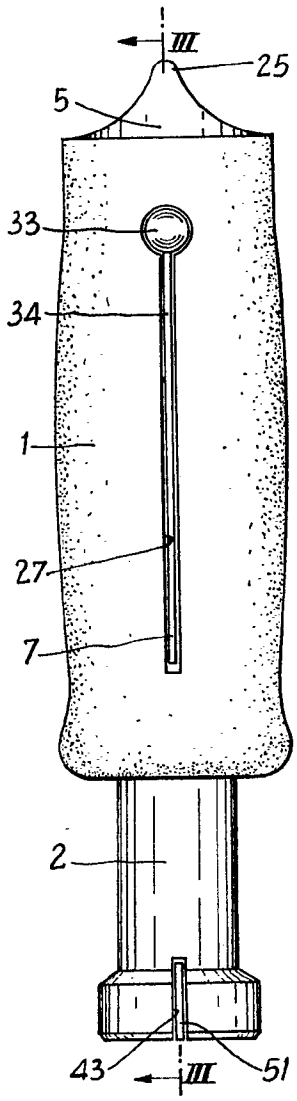
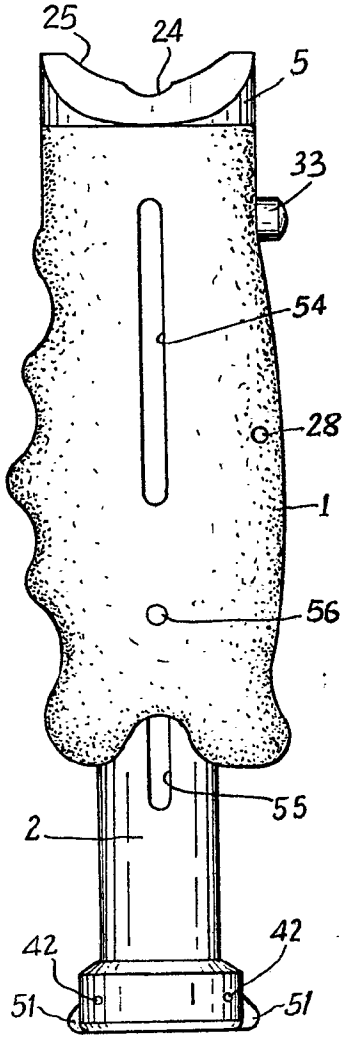


Fig:2



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Sheet 2

Fig: 3

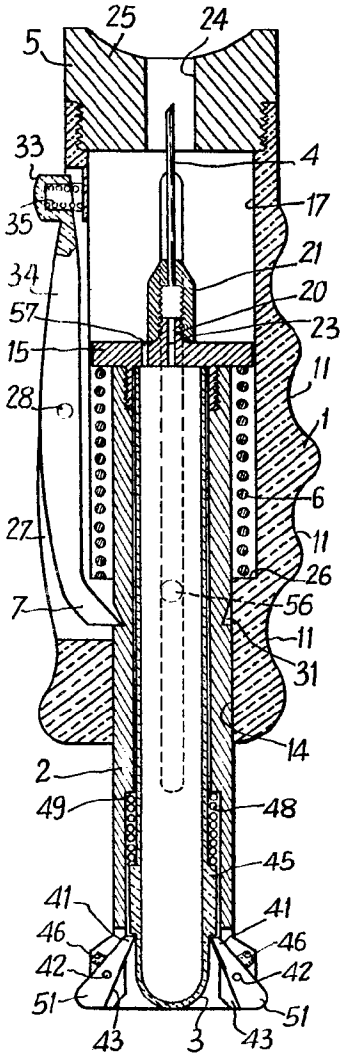

Fig: 4

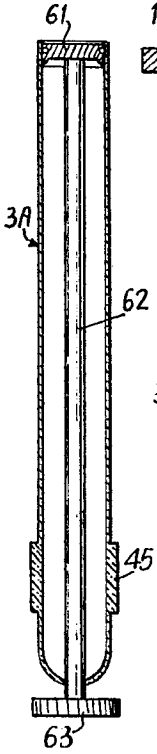

Fig: 5

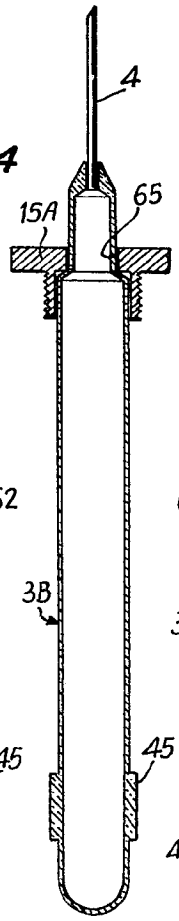

Fig: 6